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ABSTRACT

Service learning refers to a form of experiential education that emphasizes for students the importance of accomplishing tasks that meet the needs of others. This paper describes the Service Learning Projects developed by the University of Iowa's Women in Science and Engineering (WISE) program. The purpose of the program is to design, implement, evaluate, and disseminate a model program for helping educators in extracurricular settings present science activities that will interest and challenge elementary and secondary school girls. The projects aim at increasing the awareness of gender issues in science, engineering, and mathematics; promoting gender-equitable teaching in science at all levels; placing science education in the context of the community; extending the scientific and technical resources of the university into the community; and increasing the visibility of female scientists and engineers. (JRH)

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COMBINING MENTORING AND SERVICE LEARNING - A NEW APPROACH

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INTRODUCTION

At the University of Iowa, teams of female students in the engineering, sciences, and mathematics fields are taking their learning beyond the classroom and teaching their disciplines with new techniques to elementary and secondary school children in extracurricular settings. These college students are participating in *Service Learning Projects*, developed by the University of Iowa's Women in Science and Engineering (WISE) Program and sponsored by a grant from the Iowa Science Foundation.

What Is Service Learning?

Service learning refers to a form of experiential education that emphasizes for students the importance of accomplishing tasks that meet the needs of others. The National and Community Service Act of 1990 defines service learning with four criteria:

(a) students learn and develop through active participation in thoughtfully organized service opportunities that meet actual community needs;
(b) the service is related to the student's academic curriculum, and students have time to think, talk, or write about the service activity;
(c) students acquire and use new skills and knowledge in real-life situations;
(d) the service activity extends student learning beyond the classroom and helps foster a sense of caring for others.[1]

In our *Service Learning Projects*, the community need is for extracurricular science education for elementary and secondary school children. Extracurricular settings may include science clubs, other youth clubs, after-school programs, and Girl Scout groups. As for the students, college undergraduates and graduates are organized by similar academic interests in teams of four to six members. Each team is advised by a staff or faculty member from the University, or by an off-campus professional. These mentors and their teams of college students develop hands-on science activities related to their

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own academic curriculum. Activities are chosen that use gender-free language, require hands-on experience, relate the exercise to daily life, are non-competitive, and support more than one correct outcome. By working in teams, students think, talk, and document their projects in the form of curriculum packets, consequently improving their verbal and written communication skills as well as their knowledge in the academic area. Their presentation skills are also enhanced as they deliver their projects to children in various extracurricular settings.

Who are the Mentors and Mentees?

Service Learning Projects benefit two groups of mentors and mentees. The first group of mentors and mentees are the college students and the elementary/secondary school children, respectively. The college students serve as role models to the elementary and secondary school children as they deliver fun, hands-on science activities. The second group of mentors and mentees are the team advisors and the college students, respectively. The team advisors serve as mentors to the college students as they develop and deliver hands-on science activities together. These mentoring relationships are likely to continue long after the teams have completed their *Service Learning Projects*.

OBJECTIVES OF SERVICE LEARNING PROJECTS

The purpose of *Service Learning Projects* is to design, implement, evaluate, and disseminate a model program for helping educators in extracurricular settings present science activities that will interest and challenge elementary and secondary school girls while helping female undergraduate and graduate students improve their scientific expertise and develop professional communication and presentation skills. *Service Learning Projects* address three main objectives:

1) To develop a university-based service learning program for female undergraduate and graduate students in science, engineering, and mathematics disciplines.
2) To design three gender-equitable science curriculum packets for use with elementary school girls (and boys) in extracurricular settings (Rocks and Fossils for grades K-1, Structures/Engineering for grades 2-3, and Genetics for grades 4-6).
3) To deliver and evaluate all components of each curriculum packet in extracurricular settings in Iowa City and surrounding school districts.

Whom do Service Learning Projects Benefit?

On an individual basis, *Service Learning Projects* will benefit elementary school children, female college students selected for the program, and the female team advisors. On a public basis, *Service Learning Projects* will increase the awareness of gender issues in science, engineering, and mathematics, promote gender-equitable teaching in science at all levels, place science education in the context of the community, extend the scientific and technical resources of the university into the community, and increase the visibility of female scientists and engineers. Dissemination of this model program to other sites will further increase its public impact.

In addition, science and engineering groups from other institutions may benefit from *Service Learning Projects* by incorporating this model into their own outreach programs. By using *Service Learning Projects* as a model, existing outreach programs may be strengthened by adding a gender-equitable training element and by establishing strong relationships with extracurricular groups such as science clubs and other youth programs. Institutions will also be more likely to acknowledge science and engineering groups who implement outreach programs that benefit both the college students and the school children they influence. Combining service learning and mentoring accomplishes just that.

TEAM ROCKS AND FOSSILS!

Four students, one teaching associate, and one faculty advisor comprised the first Team Rocks and Fossils! and were successful in developing hands-on science activities and a curriculum packet about rocks and fossils for children in grades K-1. Highlights include a homemade fossil hunt sandbox, a list of the better fossil and geode collecting areas in Iowa, a recommended book list for children, and several coloring activities.

TEAM STRUCTURES!

Two students and one doctoral candidate advisor comprised the first Team Structures! and were also successful in developing hands-on science activities about structures and engineering for children in grades 2-3. Highlights include a story about an artist who made a mosaic picture out of tiles for a king. Today's version of the artist's creation uses seven geometric shapes that can be arranged in endless combinations to make different animal, boat, and other shapes. Team Structures! uses this activity to discuss how engineers use simple structures to build bridges, homes, and other buildings.

TEAM GENETICS!

Three students and one scientist advisor comprised the first Team Genetics! and were also successful in developing hands-on science activities and a curriculum packet about genetics for children in grades 4-6. Highlights include making fingerprints, understanding the transfer of genes down generations using jelly beans, understanding what happens when genes "jump" between chromosomes using water color paints, and creating a "monster creature" using pictures of different body parts and the concepts of dominant and recessive genes.

IMPROVEMENTS IN RECRUITMENT AND RETENTION OF WOMEN

By combining service learning and mentoring in a new approach to K-12 outreach programs, *Service Learning Projects* expect to positively influence the recruitment and retention of women in engineering, science, and mathematics fields, both at the pre-college and college levels. Although the program is currently in its first year of implementation at the University of Iowa, two out of the three teams have already delivered their projects to local after-school science programs with grand success. The Women in Science and Engineering Program is currently committed to organizing additional sites for each of the teams to visit, as well as to disseminating the completed curriculum packets to other institutions.

REFERENCES

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